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Article

The Signal and the Noise: The Impact of the Bologna Process on Swiss Graduates' Monetary Returns to Higher Education

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Abstract
Using longitudinal data on university leaver cohorts in the period from 2006 to 2016, we investigate the impact of the Bologna reform on Swiss graduates' returns to higher education. Drawing on the job market signaling model, we expect lower returns for graduates who enter the labor market with a bachelor's degree. Moreover, we expect that the initial wage difference between bachelor and master graduates will become less volatile over time, since employers constantly update their beliefs about graduates' employability. Controlling for selection into employment and a number of different signals sent by the graduates, we find a persistent advantage of a master's over a bachelor's degree. The new degrees, and especially a bachelor's degree, did indeed serve as a noisy signal about graduates' productivity in the first years of the Bologna process.

Keywords
Bologna reform; earnings; employment; higher education; labor market; signaling theory; Switzerland; university graduates

Issue
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1. Introduction

The restructuring of the higher education system in the Bologna process presents an ideal setting in which to study the formation of monetary returns to different degrees of higher education. In this regard, Switzerland is an especially interesting case since there was no equivalent degree to a bachelor's before the reform was implemented (Glauser, Zangger, & Becker, 2019). Prior to Bologna, the Swiss higher education system provided two degrees, a licentiate (diploma) and the doctorate, the latter being offered only at the 12 research-orientated universities. In the course of the Bologna process, this two-tier system has been extended to a three-tier system in which master's degrees have replaced the former licentiate. From an international perspective, both master's and bachelor's degrees were introduced rather quickly. A first cohort of graduates left Swiss universities with a bachelor's degree as early as of 2004 (State Secretariat for Education, Research and Innovation [SERI], 2019). From 2010, all new entrants to a research-orientated university have pursued a degree within the Bologna model. The development of master's (MA) and bachelor's degrees (BA) is depicted in Figure A1 in the Appendix (for better readability the abbreviations BA, for bachelor's degree, and MA, for master's degree, are used hereafter, whereby the abbreviations refer only to the academic level but not to a specific field of study).

Universities of applied sciences, providing a more practically orientated education with a pronounced degree of vocational specificity, subsequently followed this development with a first cohort of BA graduates in 2008. Unlike graduates with other upper-secondary or tertiary level degrees, graduates from research-orientated universities with a BA degree can thus be regarded as the vanguard that entered the Swiss labor market with a degree previously unknown to employers.

Although there are studies that look at particular aspects of returns to higher education in Switzerland (e.g., examining the role of informal job-search channels; Franzen & Hangartner, 2006), there is a lack of studies that fully examine monetary returns after the Bologna reform. Against this background, we ask how the introduction of new degrees constitutes a previously unknown signal for employers regarding graduates' productivity, and how this in turn shapes the income disparities among holders of different university degrees. Since improving the employability of graduates was one of the key goals of the Bologna process (Schomburg & Teichler, 2011), this article also presents an assessment of the success of the reform. In this regard, we evaluate whether one of the reform's initial promises—namely the so-called "employability" of graduates with the new BA qualification—is fulfilled.

Using panel data on graduates from Swiss universities in the period from 2006 to 2016, we examine how the returns to BA and MA degrees differ with graduates' characteristics (e.g., gender, field of study, type of university, further training, etc.) within the first five years after graduation from university. While this institutional change occurred in the period of the international financial crisis, it has to be noticed that this exogenous shock of the global financial crisis likely had only a minor effect upon graduates' wages since Switzerland was only marginally affected by this event. Unemployment as well as differences in returns in terms of status attainment across university degrees, for example, remained at a stable and very low level (Zangger, Glauser, & Becker, 2018).

The remainder of this article is organized as follows. In the next section, we outline our theoretical framework with a particular focus on job market signaling and briefly summarize existing research. The third section outlines the data and methodological approach. This is followed by the empirical results in the fourth section. We conclude with a brief discussion in the fifth section.

2. Background

The introduction of new, formerly unknown degrees into the Swiss higher education system as a consequence of the Bologna process is an ideal setting in which to test the theoretical assumptions of the job market signaling model (Weiss, 1995). In contrast to traditional human capital theory (Becker, 1964; Mincer, 1974), signaling theory suggests that the returns to different degrees of higher education do not reflect skills acquired throughout the time spent in the education system, but are mere indicators of ex-ante abilities and productivity (Arrow, 1973; Spence, 1973; Stiglitz, 1975). The argument proceeds as follows. In most labor markets, employers lack accurate information about potential employees' productivity. It is for this reason that they use—based on their experience and beliefs—observed characteristics of job applicants as signals (alterable) and indices (fixed) to infer workers' productivity and abilities (Spence, 1973, p. 357). The wage offered is then a function of these signals and indices. However, the relationship between signals and offered wage is a mutual one, since employers constantly update their own beliefs about the conditional probability distribution of workers' productivity (i.e., they adjust their interpretation of signals and indices based on the newly hired employees' observed productivity; Arrow, 1973). Moreover, since signals are alterable, workers also select different signals based on anticipated earnings (Spence, 1973). In this regard, acquiring a signal is costly and depends on an individual's ability: Successfully completing an MA, for example, comes along with less effort for high-ability individuals and is more demanding for low-ability individuals. For the latter, continuing education is also associated with a higher uncertainty because they face a higher risk of not successfully completing the desired degree. Educational certificates are the main signal on which employers base their employment decisions and offered wages. However, they also resort to other signals and unalterable indices, such as a potential employee's work history, age, or gender. Most importantly, however, the probabilistic nature of signals and their dynamic, mutual relation to the offered wage also implies that returns to education vary with time, and, especially, with the amount of uncertainty associated with an educational certificate.

As long as there is no institutional change of certificates in higher education, the degrees serve as a fairly secure screening device (Stiglitz, 1975), and employers can rely on the university system as a "filter" when recruiting applicants (Arrow, 1973). However, if new certificates are introduced into the educational system, as was the case in the course of the implementation of the Bologna reform, employers' uncertainty about the productivity of applicants attaining the previously unknown university degrees is expected to be high. This uncertainty might therefore have an effect on the earnings offered by the employers to graduates with formerly unknown degrees. In the present case, the Bologna process introduced two noisy signals, a BA and an MA degree, which were previously unknown in the Swiss education system.

On the one hand, these signals are also accompanied by a detailed record of attended courses and grades obtained, thus enabling a more direct ex-ante assessment of a potential employee's productivity. On the other hand, the different duration of the two degrees might also be an inherent signal to employers. In this regard, both signaling as well as human capital approaches would suggest higher earnings for MA than for

BA degrees due to both the quantity and the quality of graduates' investment in skills (Lörz & Leuze, 2019; Neugebauer & Weiss, 2018). However, while a human capital perspective would predict only more heterogeneous responses of employers during a transition period due to the additional uncertainty of the two new signals, signaling processes also suggest competing hypotheses about the reform's effects on graduates' returns.

Compared to persons who left university with a BA, graduates with an MA might signal higher ex-ante productivity and ability since they were able to complete a more demanding degree and were willing to forgo earnings for a longer period of time (Neugebauer & Weiss, 2018). However, since there are no admission restrictions on MA degrees in Switzerland (Glauser et al., 2019), the first argument does not necessarily follow. The opposite could even be true: rather than a positively selected group (Trennt, 2019), some graduates with an MA degree might have opted to stay in education for a longer period of time to compensate for the negative signal of a below-average BA degree with the positive signal of an MA and to reduce the risk of unemployment after graduation (Cappellari & Lucifora, 2009; Glauser et al., 2019). Likewise, the uncertainty about the returns to the new degrees, and especially regarding the new BA, was also factual for graduates. This might have presented individuals with an incentive to continue studying at master level, independent of their ability. In the same vein, replacing one existing signal (licentiate) with two new ones (BA and MA) could also have sent a more direct message to employers. Since one of the communicated goals of the Bologna process was to enhance graduates' employability, with a BA degree as the intended norm for entering the labor market (Schomburg & Teichler, 2011), employers might regard graduates with a BA as especially motivated and suitable candidates in the labor market. However, they could also presume that holders of a BA degree are not smart enough to complete a more demanding educational career, and thus take a BA as a signal of a reduced productivity. This also follows from the argument made above that the selection of different signals by individuals is associated with higher risk and costs for low-ability individuals. Both lines of argument highlight the importance of controlling for additional measures of ability and productivity when estimating the returns to different degrees—namely, grades or exit examination scores (Altonji & Pierret, 2001; MacLeod, Riehl, Saavedra, & Urquiola, 2017).

With the introduction of BA and MA degrees, employers had thus to weight different sources of uncertainty against each other. This is especially true in the case of a BA degree. Given the counteracting considerations elaborated above and the fact that a detailed track record with grades is available as a consequence of the Bologna reform, it seems fair to assume that employers extrapolated their assessment of the productivity of graduates with a licentiate to the first cohorts of graduates with an MA degree. However, the grades of BA graduates did not allow an assessment of their productivity compared to that of holders of other degrees. Instead, the BA graduates' grades could only be used in the screening among different applicants with this degree. Given the mentioned discourse about the employability of BA graduates, employers consequently might have overestimated graduates' productivity in the beginning, offering them salaries close to those of graduates with an MA degree. On the other hand, assuming that employers try to maximize their utility (and minimize their risk), it also seems plausible that a BA degree would be associated with lower pay for the first cohorts of graduates in order to avoid losses due to an erroneous overestimation of BA graduates' productivity. Consequently, the difference in returns to graduates with an MA degree should become less pronounced for subsequent cohorts of graduates, as employers acquire information about the productivity of BA graduates. Given the contradictory reasoning, however, we expect only that the initial wage difference between BA and MA graduates will become less volatile across cohorts of graduates. Furthermore, we expect that the differences in returns to various university degrees become less pronounced with increasing time spent in the labor market. Against the background of the importance of further education and training for graduates with general education certificates such as those obtained from studying at a university (Hanushek, Schwerdt, Woessmann, & Zhang, 2017), the effect of the initial signal is subsequently replaced by new signals and information about workers productivity. Since this holds true for both graduates with a BA as well as those with an MA degree, it can thus be expected that the initial wage differential between the two groups should become less pronounced.

With regard to empirical evidence, studies draw a mixed picture, supporting both the idea of human capital theory as well as the assumptions of the signaling models (e.g., Alesi, Schomburg, & Teichler, 2010; Arcidiacono, Bayer, & Hizmo, 2010; Heckman, Lochner, & Todd, 2003; Hout, 2012; Neugebauer & Weiss, 2018). Recent (experimental) evidence, for example, indicates that employers indeed take educational degrees as signals for workers' ex-ante productivity (Deming, Yuchtman, Abulafi, Goldin, & Katz, 2016). However, contrary to the assumption of signaling theory, the advantage of higher degrees does not automatically decrease with increasing labor force experience—at least when considering college reputation as a signal (MacLeod et al., 2017). In line with this finding, a vast literature reports higher returns for higher degrees over the life course (for a compact summary, see Posselt & Grodsky, 2017), although the patterns differ considerably with the institutional context, namely the development of the vocational system (Breen, 2005; Hanushek et al., 2017).

Meanwhile, there is also evidence that points to alternative explanations for different returns to BA and MA degrees. Altonji, Kahn and Speer (2016), for example, demonstrate how labor market conditions affect

graduates of various fields of study and backgrounds differently, highlighting that such external conditions might also explain the varying development of returns to BA and MA degrees. Similarly, in line with the above-outlined mechanism of diminishing returns to an MA degree due to a negative selection of students who try, for example, to avoid a bad start in the labor market (Carneiro, Heckman, & Vytlacil, 2011; Trennt, 2019), Cappellari and Lucifora (2009) show that regional labor market conditions and opportunity costs do indeed shape the selection into an MA program. However, since labor market prospects changed little even during the financial crisis of 2008 in Switzerland, we expect that such macro-processes play only a minor part in the explanation of different returns to BA and MA degrees in the present case.

3. Data and Methods

To analyze income differences between BA and MA graduates, panel data of the Swiss Graduate Survey (SGS; for details, see the SGS fact sheet at the Federal Statistical Office online page: www.bfs.admin.ch/bfs/en/home/statistics/education-science/surveys/ashs.html) has been employed. Our sample of this biennial census survey conducted by the Swiss Federal Statistical Office is limited to graduates from Swiss universities holding a BA or an MA degree. Graduates of universities of applied sciences and universities of teacher education are not included in our analyses. The SGS data are collected both one and five years after graduation. Given our focus on the development of income differentials in the course of the Bologna process, we consider only recent cohorts that graduated between the years 2006 and 2016 from all Swiss universities. Due to the small number of cases, graduates of the 2004 cohort are excluded, while data for the 2018 cohort were not yet available.

The main dependent variable in the analyses is the gross monthly income one and five years after graduation. In this regard, we consider respondents' income from main and secondary employment as well as paid overtime and fringe benefits (bonuses, commissions), deflated with May 2000 serving as the basis. Due to the skewed distribution, the monthly income is logarithmized. In addition to analyses related to the income distribution, we use the relative income change in terms of the ratio of wages between the first and fifth year after graduation. To this end, we divide the deflated income five years after graduation by the corresponding value one year after graduation. Thus, values bigger than 1 refer to a growth in personal income over four years while values smaller than 1 correspond to a decline in income. We further restrict our sample to graduates who are employed or economically inactive at the time of the survey, with non-missing information on income for the employed. Moreover, to qualify as gainfully employed, graduates must have a monthly income of at least 1000 CHF and work at least eight hours a week. Likewise, the self-employed are excluded from our analyses. To reduce age-related heterogeneity, the maximum age in the analysis sample is 35 years.

The analyses related to the *monthly income one year after graduation* are based on 13,149 men and 13,102 women of the university leaver cohorts from 2006 to 2016. In addition to the attained university degree (BA, MA) we control for the field of study (Social Sciences & Humanities, Economics, Law, Science, Medicine & Pharmacy, and Technical Sciences), the type of university (cantonal university vs. one of the two prestigious universities—ETH and EPFL) and final grades (a 4 corresponds to the minimum pass mark and a 6 to the highest mark). Additionally, completed and ongoing further training are considered. We differentiate between graduates who have completed further tertiary training at the same level (e.g., a second BA) or a higher level (e.g., PhD after MA or MA after BA), and those who have not completed any additional training at tertiary level. Besides, we take into account whether individuals have completed further training that does not lead to an MA or a PhD, but which has a minimum duration of six months. In addition, we control for whether individuals are in training at the time of the survey. In this respect, only training courses lasting six months or longer are considered. Finally, the weekly working hours and the region in which persons are employed (German-, French-, or Italian-speaking Switzerland, or working abroad) has been considered. The variables described above are used in the same way in relation to the analyses of the *monthly income five years after graduation* that are based on 4,737 men and 4,465 women from the university leaver cohorts of 2006 to 2012. Regarding the *relative income growth* between the first and fifth year after graduation, we can consider only individuals with non-missing data on income in both survey time points. Therefore, the sample sizes for men (4,127) and women (3,922) are lower compared to those we use in the income analyses five years after graduation. The same control variables as outlined above are taken into account, but additionally the income in the first year after graduation is included in our analyses. Descriptive statistics of the dependent and independent variables are provided in the Appendix (see Tables A1 and A2).

We run all our analyses separately for men and women, since selection into employment, employment patterns, and income distributions differ by gender (Schömann & Becker, 2002; Wise & Zangger, 2017). To account for possible selection into employment, we use the Heckman selection model (Heckman, 1979), because the estimators of simple ordinary least squares (OLS) are biased if selection into employment is present. However, the application of the Heckman selection model assumes that there is a sufficiently large sample, that the errors are distributed normally and homoscedastically, that the number of censored cases is not too high, and that the correlation ρ of the error terms between the selection and estimation equations is sufficiently large (Breen,

1996; Cameron & Trivedi, 2010; Windzio, 2013). In the samples we analyze, we find no selectivity into employment for men but for women. Additionally, diagnostic tests of normality and homoscedasticity in the case of women show that the assumptions are violated. Nevertheless, results of the Heckman models are reported for both sexes for improved comparability, while we additionally provide the results of the OLS regressions in the Appendix (see Tables A7 and A8). The results and the interpretation of their meanings do not differ substantially between the different models. In the selection equation, we use all controls of the main models and additionally account for marital status and parenthood. Further, we use survey weights provided in the data to account for selectivity with regard to participation in the SGS. All estimated models are based on the Full-Maximum-Likelihood method (see Cameron & Trivedi, 2010, or Wooldridge, 2002) since weights are not permitted in the common Heckman model. In order to reduce bias that could occur due to implausible combinations of income and person-specific characteristics, we exclude a small number of cases based on the most extreme values obtained in regression diagnostics regarding the leverage, cooks' D, dffits, and dfbetas (Meuleman, Loosveldt, & Emonds, 2015). Additional sensitivity analyses, which are available upon request from the authors, show that a more restrictive exclusion of cases does not alter our results.

In our statistical models (see Tables 1 and 2), the focus is mainly on the main effect of the university degree on income and the relative income change. Additionally, and in order to describe changes concerning our dependent variables over university degree and cohorts more intuitively, we present the results of the interaction terms for degree and cohort graphically, while the corresponding tables are shown in the Appendix (see Tables A5 and A6).

4. Empirical Results

One year after graduation, about 86% of men and 85% of women of our sample are gainfully employed. On average, the mean income of women (M = 4,865, SD = 2,006) is lower compared to men (M = 5,553, SD = 2,262, see Table A1 in Appendix). In contrast to the findings for men (see Table A3 in Appendix), we observe selectivity into employment for women (see Table A4 in Appendix). Women are more likely to be in the observed sample of employed graduates if they have attained an MA degree, those with better final grades as well as the childless and unmarried. It is therefore appropriate, at least for our analyses of women's income differentials, to control for selectivity into employment. Since the parameters to estimate possible sample selection (inverse of the hyperbolic tangent of ρ, athrho in Tables 1 and 2) are insignificant in the case of men, we do not interpret the findings of the selection equation (see Table A3 in Appendix).

Turning our attention to the main effects of an MA degree on the log monthly income, we observe significant differences in the returns for both men and women (see Tables 1 and 2). In line with assumptions of human capital and signaling theory, entering the labor market with an MA rather than a BA degree leads to 4 log points higher earnings for women and 14 log points higher earnings for men one year after graduation. Thus, one year after graduation, men with an MA degree show higher income advantages than women. Moreover, there are also striking differences in the returns according to the field of study, the institutional type of the university, and final grades. Graduates from one of the two prestigious technical universities (ETH/EPFL) earn up to 8% more than graduates from other universities, independent of their degree, field of study, and further controls such as additional qualifications obtained or the region of employment. Likewise, returns differ considerably between fields of study, with economics yielding the highest, and law the lowest, one year after graduation. It should be noted that these differences between fields are even more pronounced when not controlling for the weekly working hours, indicating that part-time employment varies considerably among graduates from different fields (results not reported). Further, but only for the sample of women, the first cohort of graduates earned significantly less one year after graduation than their more recent counterparts.

In a next step, we examine the earning differentials five years after graduation. The descriptive findings show the following picture. About 91% of men are employed, while the proportion of women is somewhat lower (89%). As in the first year, men (M = 7,378, SD = 2,802), on average, have considerably higher incomes than women (M = 6,294, SD = 2,219, see Table A2 in Appendix). The results of the multivariate analyses (see Tables 1 and 2) do not indicate that the advantage of an MA degree compared to a BA degree is decreasing five years after graduation. The difference has slightly decreased for men but strongly increased for women for whom an advantage of 13 log points is observed. As before, graduating from a prestigious university (ETH/EPFL) is still associated with higher returns, although the effect is reduced to about 9% higher earnings—at least for men, while the effect for women is insignificant. However, and as already mentioned with regard to income differentials at the beginning of employment, the income five years after graduation is most strongly influenced by the field of study. While all graduates earn less than those graduating with a degree in economics, the income disadvantages have declined remarkably for graduates with a degree in law while the changes for graduates of other disciplines are comparatively small. Finally, the differences by graduation cohorts are negative but insignificant. Thus, we do not observe that earnings have declined over graduation cohorts.

However, it is important to note that the results reported above on income one and five years after graduation are based on different samples. In the previously presented results, it is thus not considered how the income

Table 1. Men's monthly income (log.) in the first and fifth year after graduation and their relative income growth.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.143***	(0.016)	0.124***	(0.016)	0.052	(0.133)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.280***	(0.013)	−0.223***	(0.018)	−0.339**	(0.115)
Law	−0.479***	(0.016)	−0.147***	(0.017)	−0.167	(0.160)
Science	−0.327***	(0.012)	−0.284***	(0.017)	−0.636***	(0.134)
Medicine/Pharmacy	−0.139***	(0.013)	−0.175***	(0.023)	−0.247**	(0.081)
Technical Sciences	−0.262***	(0.016)	−0.281***	(0.022)	−0.576***	(0.119)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.124***	(0.013)	0.086***	(0.018)	0.181*	(0.073)
Final grade	0.039***	(0.010)	0.058***	(0.014)	0.084	(0.071)
Age	0.022***	(0.002)	0.014***	(0.002)	0.027**	(0.010)
Cohort (*Ref.: 2006*)						
2008	−0.001	(0.017)	0.016	(0.015)	−0.094	(0.157)
2010	0.002	(0.016)	−0.005	(0.015)	−0.194	(0.139)
2012	−0.018	(0.015)	−0.025	(0.014)	−0.226	(0.149)
2014	−0.003	(0.015)				
2016	−0.010	(0.015)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.031	(0.029)	−0.019	(0.021)	−0.167	(0.230)
Higher qualification	−0.077*	(0.031)	−0.072***	(0.016)	−0.234	(0.126)
Other training completed (*Reference: no*)						
Yes	0.066***	(0.018)	0.075***	(0.012)	0.154	(0.097)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.233***	(0.008)	−0.256***	(0.012)	−0.648***	(0.092)
Weekly working hours	0.015***	(0.001)	0.024***	(0.001)	0.043***	(0.005)
Language region of employer (*Ref.: German-speaking*)						
French- /Italian-speaking	−0.089***	(0.008)	−0.133***	(0.010)	−0.172***	(0.046)
Italian-speaking	−0.261***	(0.021)				
Abroad	−0.352***	(0.016)	−0.298***	(0.023)	−0.507***	(0.075)
Log. monthly income 1st year					−2.587***	(0.373)
Constant	7.338***	(0.080)	7.321***	(0.112)	21.368***	(3.318)
athrho	0.001	(0.011)	−0.017	(0.045)	−0.011	(0.010)
lnsigma	−1.048***	(0.009)	−1.267***	(0.014)	0.304	(0.185)
Observations	13'149		4'737		4'127	
N (selected/censored)	11'303/1'846		4'306/431		3'696/431	
Wald chi^2/DF	5782.671/22		3001.256/19		578.535/20	

Data: SGS, own calculations. Notes: Log gross monthly income (deflated to base May 2000); estimations based on Full-Maximum-Likelihood method using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. For results of the selection equation, see Table A3 in Appendix.

changes within the first five years and how this relates to the differential between holders of a BA or MA degree. In the following, we thus examine the income dynamics after entering the labor market in more detail. In this respect, the earnings growth rate is calculated by dividing the log earnings five years after graduation by the log earnings one year after graduation. In the case of men (see the last two columns of Table 1), the results do not indicate that the average earnings growth rate differs between the degrees. This contrasts with the findings for women (see Table 2). For the latter, it is evident that an MA degree is associated with significant advantages in terms of income growth. For women with an MA, for example, the growth rate over four years is about 123% of that of women with a BA degree ($e^{0.209} \approx 1.232$). Extrapolating from this rather short observation window of four years, we would thus conclude that the differences in earnings by university degree do not become smaller with increasing time spent in the labor market. At least with regard to women, this finding then contradicts our hypothesis that the original signal of the diploma itself is subsequently replaced by new information about employees' productivity, and that on-the-job training is of special importance for graduates from higher education (Hanushek et al., 2017).

Finally, we expected that earning differentials should be more volatile for the first cohorts of BA and MA graduates since it takes time for employers to update their

Table 2. Women's monthly income (log.) in the first and fifth year after graduation and their relative income growth.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.041**	(0.015)	0.131***	(0.015)	0.209**	(0.068)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.226***	(0.012)	−0.173***	(0.016)	−0.320***	(0.052)
Law	−0.422***	(0.015)	−0.080***	(0.017)	−0.067	(0.065)
Science	−0.254***	(0.015)	−0.215***	(0.019)	−0.440***	(0.064)
Medicine/Pharmacy	−0.111***	(0.014)	−0.151***	(0.019)	−0.200***	(0.057)
Technical Sciences	−0.215***	(0.022)	−0.212***	(0.028)	−0.363***	(0.075)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.080***	(0.017)	0.035	(0.019)	0.049	(0.046)
Final grade	0.012	(0.012)	0.019	(0.013)	−0.045	(0.055)
Age	0.018***	(0.002)	0.003	(0.002)	0.004	(0.008)
Cohort (*Ref.: 2006*)						
2008	0.054*	(0.026)	−0.003	(0.017)	−0.108	(0.088)
2010	0.050*	(0.024)	0.001	(0.016)	−0.123	(0.075)
2012	0.049*	(0.023)	−0.007	(0.015)	−0.126	(0.074)
2014	0.076***	(0.023)				
2016	0.061**	(0.023)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	0.051	(0.027)	0.001	(0.018)	0.055	(0.081)
Higher qualification	−0.035	(0.054)	−0.037*	(0.019)	−0.252***	(0.047)
Other training completed (*Ref.: no*)						
Yes	0.040	(0.021)	0.066***	(0.011)	0.204***	(0.044)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.200***	(0.009)	−0.125***	(0.012)	−0.310***	(0.038)
Weekly working hours	0.014***	(0.001)	0.024***	(0.001)	0.033***	(0.002)
Language region of employer (*Ref.: German-speaking*)						
French- /Italian-speaking	−0.052***	(0.008)	−0.095***	(0.010)	−0.172***	(0.041)
Italian-speaking	−0.220***	(0.022)				
Abroad	−0.321***	(0.019)	−0.440***	(0.025)	−0.680***	(0.074)
Log. monthly income 1st year					−2.083***	(0.124)
Constant	7.641***	(0.086)	7.736***	(0.106)	18.289***	(1.294)
athrho	−1.183***	(0.050)	−0.176*	(0.089)	−0.012	(0.032)
lnsigma	−0.828***	(0.010)	−1.297***	(0.015)	−0.151	(0.135)
Observations	13'102		4'465		3'922	
N (selected/censored)	11'211/1'891		3'992 /473		3'449/473	
Wald chi^2/DF	3265.465/22		2440.174/19		1413.777/20	

Data: SGS, own calculations. Notes: Log gross monthly income (deflated to base May 2000); estimations based on Full-Maximum-Likelihood method using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. For results of the selection equation, see Table A4 in Appendix.

beliefs about graduates' productivity, especially in the case of those entering the labor market with a BA degree. In this regard, the estimated log monthly income for the interaction effects between degree and cohort are illustrated in Figures 2 and 3. First, it is obvious that the income advantages with an MA degree one year after graduation are more pronounced for men, as already outlined above. However, due to the U-shaped pattern in the case of men, the time interval covered by the data in our view is too short to conclude that the income disadvantages with a BA degree have remained constant across cohorts. Of course, the benefits for the MA degree are obvious, but they could weaken further if the trend since the 2012 cohort continues. These results stand in stark contrast to those for women. What is noticeable is the fact that one year after graduation, the income differentials between holders of a BA and MA degree of all but the cohort of 2014 are unexpectedly small and insignificant. In contrast, the results for income differentials five years after graduation show a different picture. For both men and women, a more or less parallel trend is observed for the income earned with an MA degree. While the differences compared to the BA degree are comparatively constant for women, the results for men tend to point to an increase in income differences for the youngest cohorts. In case of the relative income growth, a similar pattern is observed for both men and women. The noise that can be observed in the first cohorts also

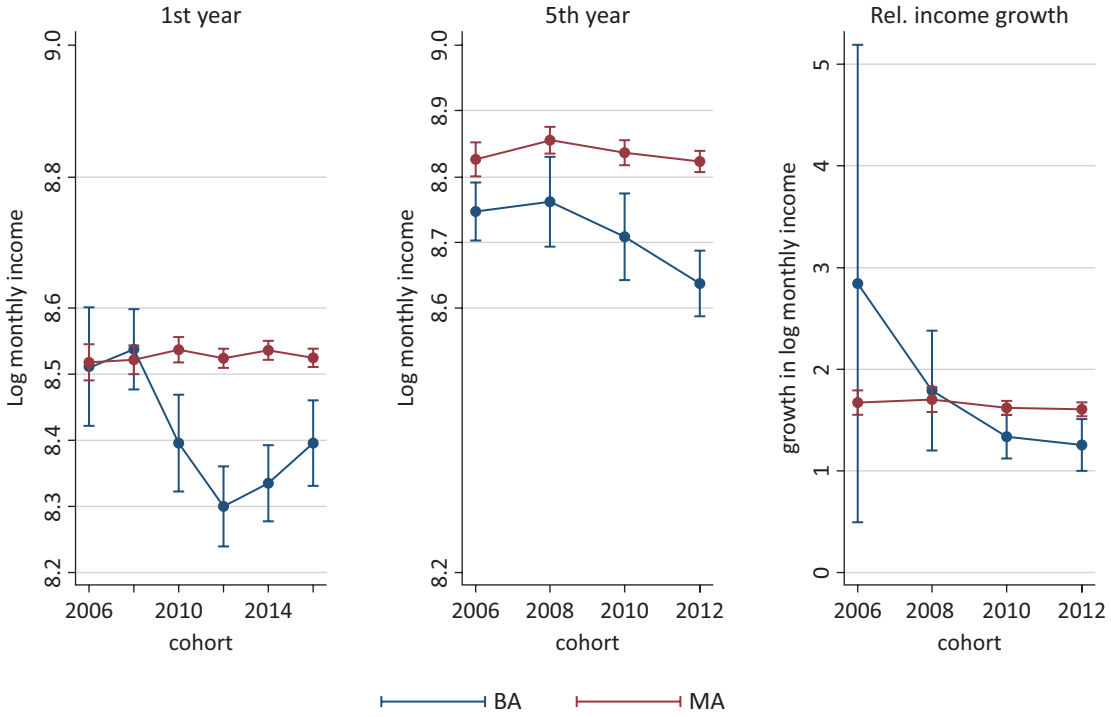

Figure 1. Linear predictions of interactions of university degree and cohort on gross monthly income (log) for men in the first and fifth year after graduation and their relative income growth. Data: SGS, own calculations. Note: See Table A5 in Appendix for further details.

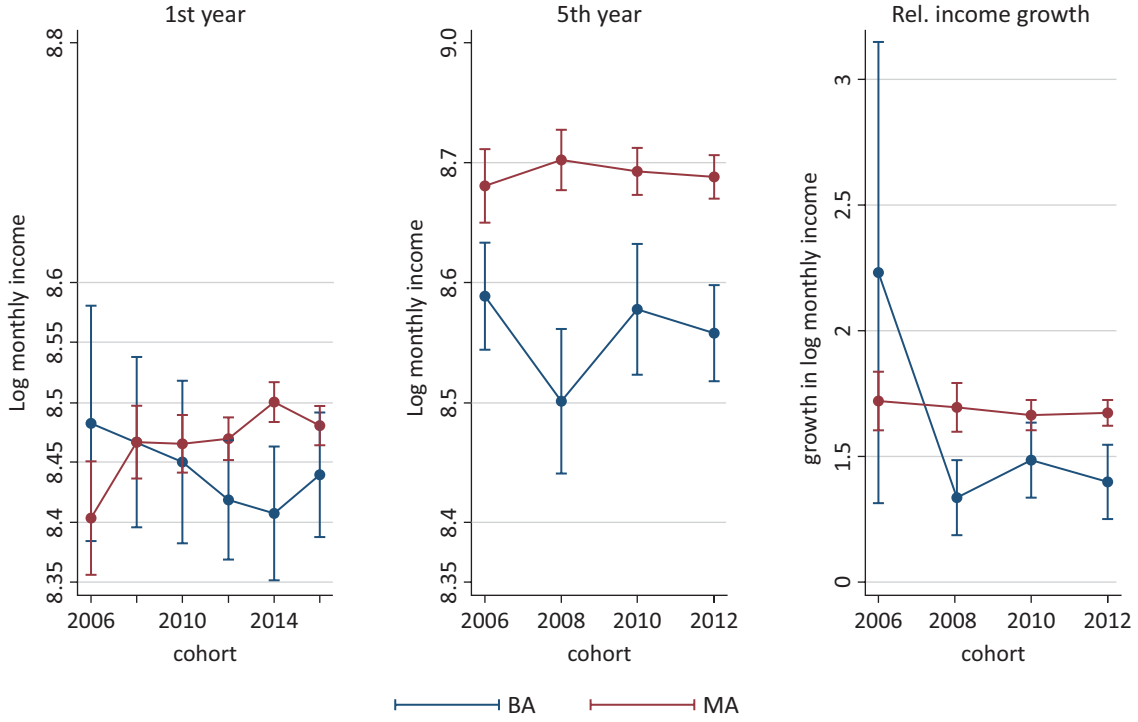

Figure 2. Linear predictions of interactions of university degree and cohort on gross monthly income (log) for women in the first and fifth year after graduation and their relative income growth. Data: SGS, own calculations. Note: See Table A6 in Appendix for further details.

develops in such a way in terms of income growth, at least for the younger cohorts, that there are advantages for holders of an MA degree. Together, these findings then indicate that employers did indeed need time to get to know the productivity of graduates with a BA degree. However, we do not observe that employers tried to reduce their risk, and therefore paid substantially less to the first cohorts of graduates. It is rather the case that

employers adjusted the starting salaries of individuals with a BA degree downwards during the observation period. Nonetheless, these additional results highlight the argument made in the theoretical section relating to less ambiguity about the productivity of graduates with an MA degree, indicated by fairly constant earnings and income growth for such graduates over successive cohorts while the returns to a BA degree are more volatile.

5. Discussion and Conclusions

Against the background of the implementation of the Bologna reform in Switzerland, the aim of this study was to compare monetary returns at the start of BA and MA graduates' working lives. Based on longitudinal data on university leaver cohorts from 2006 to 2016 of the SGS, we analyzed how the returns on the newly introduced degrees (BA, MA) differ in terms of earnings one and five years after graduation. Moreover, we examined the relative income growth indicated by the ratio of the wages within this time span. Referring to signaling theory, we emphasized that the two new degrees introduced two previously unknown signals for employers regarding graduates' productivity. In this regard, the introduction of the BA was considered an especially noisy signal for employers when trying to assess graduates' productivity since there was no equivalent degree prior to the Bologna process. Since MA degrees replaced the former licentiate, we expected this type of degree to be a less uncertain signal for employers.

Our results show that one year after graduation, men show a significantly higher income differential (MA vs. BA) than women. Although this result is in line with earlier studies on differentials in the income growth of men and women (Engelhardt & Jann, 2004), it is nevertheless surprising given that women now constitute the majority at Swiss universities. Indicated by the striking differences for men and women in the selection equation of our models, persistent gendered division of labor might add their share to explain this pattern ("modernized traditionalism"; Becker & Jann, 2017). Nevertheless, a more thorough examination is needed. Moreover, there are remarkable differences in the returns according to the field of study, the institutional type of the university, and final grades. Five years after graduation, the disparities of income among the different types of degree remain persistent across graduation cohorts, while the impact of field of study as another signal has increased in the course of graduates' career trajectories. The same holds true for the influence of further education and training after graduation, highlighting that on-the-job training is indeed of special importance for graduates from higher education (Hanushek et al., 2017). Likewise, the initial signal of graduating from a prestigious university is also found to decline over the course of graduates' careers. The influence of the main signal of a higher degree, however, declines only marginally over the first five years for men and becomes even more important in the case of women. As expected, the returns to an MA are stable over successive cohorts of graduates, while the earnings of those entering the labor market with a BA are much more volatile, indicating a marginal overestimation of their productivity by employers in the case of the first cohorts of graduates.

While the (persistent) advantage of an MA over a BA can be explained by both human capital as well as job market signaling theory, there are some particularities which indicate that, at least for the first cohorts in the Bologna process, the new degrees, and especially the BA, did indeed serve as a noisy signal about graduates' productivity to employers (Arrow, 1973; Spence, 1973). In this regard, other signals of ex-ante productivity decline in the short period of four years in the labor market (such as graduating from a prestigious university). More importantly, however, the big initial volatility and the subsequent decline in the earnings of graduates with a BA over cohorts, contrasted by constant and precisely estimated earnings for graduates with an MA, indicate that employers were uncertain and initially overestimated BA graduates' productivity. Consequently, this suggests that the returns to a university degree not only reflect the skills acquired in the education system but are also an assessment of a graduate's ex-ante productivity.

Meanwhile, there are also alternative explanations for our results. Because job-, firm-, and labor market-specific information is lacking in our data, it is also possible that BA and MA graduates work in different segments of the labor market, which would provide another explanation for the observed earnings differentials (Baron & Bielby, 1980). This then also highlights the importance of considering such characteristics in future research.

Lastly, as another limitation on our study, it should be emphasized that the "observation window" in terms of historical period and individuals' labor force experience covered in the data is too short to describe a long-term trend and cohort patterns of income differentials between holders of a BA and MA degree (see Schömann & Becker, 2002). On the other hand, there are indications that employers become increasingly familiar with the new degrees institutionalized in the course of the Bologna reform. On the other hand, it would be interesting to investigate the lifetime income for BA and MA graduates. From the perspective of human capital theory, the disparities of starting wages might be persistent across the working life. However, based on the data at hand, we are unable to follow this topic further. Moreover, future research might also investigate whether the disparities and their development among graduates of different degrees could also be explained by a varying likelihood of mobility between jobs, firms, and industries (e.g., Becker & Blossfeld, 2017).

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Conflict of Interests

The authors declare no conflict of interests.

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Annex

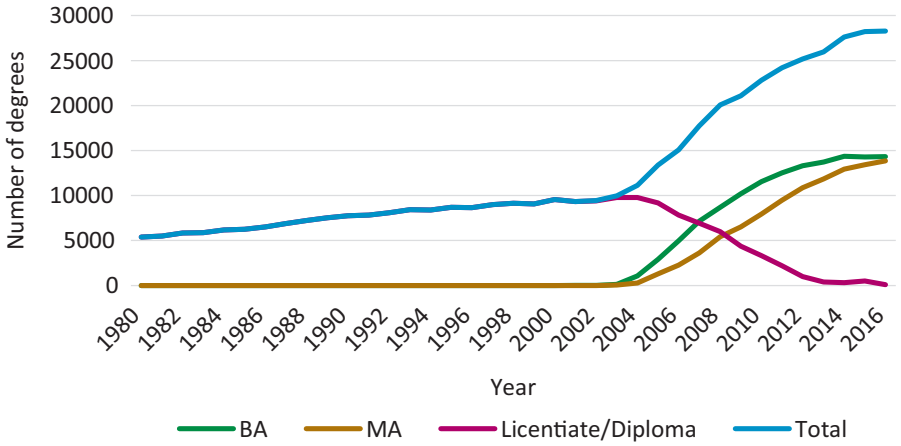

Figure A1. Development of degrees in Switzerland from 1980 to 2016 (absolute figures, men and women). Data: FSO (2017); own representation.

Table A1. Descriptive statistics: First year after graduation.

	Women		**Men**	
	Proportion Mean/SD	*95%- CI Min./Max.*	*Proportion Mean/SD*	*95%- CI Min./Max.*
Gross monthly income	4'865/2006	904; 21555	5553/2262	904; 20843
Degree				
BA	0.1169	0.1112,0.1226	0.0826	0.0777,0.0875
MA	0.8831	0.8774,0.8888	0.9174	0.9125,0.9223
Field of study				
Social Sciences, Humanities	0.3758	0.3668,0.3849	0.1396	0.1332,0.1461
Economics	0.1595	0.1523,0.1667	0.2726	0.2640,0.2812
Law	0.1659	0.1589,0.1730	0.1063	0.1005,0.1121
Science	0.1479	0.1414,0.1544	0.2253	0.2177,0.2329
Medicine/Pharmacy	0.0768	0.0719,0.0817	0.0395	0.0359,0.0431
Technical Sciences	0.0740	0.0691,0.0789	0.2167	0.2090,0.2243
Type of university				
Cantonal university	0.8659	0.8597,0.8722	0.6693	0.6606,0.6780
ETH/EPFL	0.1341	0.1278,0.1403	0.3307	0.3220,0.3394
Final grade	5.20/0.38	4.00; 6.00	5.23/0.38	4.00; 6.00
Age	26.97/2.17	22.00; 35.00	27.34/2.19	21.00; 35.00
Cohort				
2006	0.0324	0.0292,0.0357	0.0552	0.0510,0.0593
2008	0.1014	0.0954,0.1074	0.1210	0.1147,0.1274
2010	0.1421	0.1355,0.1487	0.1467	0.1400,0.1534
2012	0.2165	0.2090,0.2241	0.2003	0.1930,0.2075
2014	0.2386	0.2307,0.2466	0.2301	0.2222,0.2379
2016	0.2689	0.2606,0.2772	0.2468	0.2387,0.2549
Completed additional training at university				
No training completed	0.9693	0.9661,0.9726	0.9782	0.9755,0.9810
At same level	0.0290	0.0259,0.0322	0.0199	0.0173,0.0225
Higher qualification	0.0016	0.0009,0.0024	0.0019	0.0011,0.0027
Other training completed				
No	0.9552	0.9513,0.9591	0.9681	0.9648,0.9714
Yes	0.0448	0.0409,0.0487	0.0319	0.0286,0.0352
In training at the time of the survey				
Not in training	0.7033	0.6948,0.7119	0.6856	0.6770,0.6943
In training	0.2967	0.2881,0.3052	0.3144	0.3057,0.3230
Weekly working hours	37.09/9.22	8.00; 80.00	39.12/7.81	8.00; 80.00
Language region of employer				
German-speaking	0.5717	0.5624,0.5811	0.6100	0.6008,0.6192
French-speaking	0.3119	0.3031,0.3207	0.2589	0.2506,0.2671
Italian-speaking	0.0344	0.0310,0.0379	0.0294	0.0262,0.0325
Abroad	0.0820	0.0765,0.0874	0.1018	0.0958,0.1078
Marital status				
Single	0.9005	0.8947,0.9063	0.9189	0.9137,0.9242
Married, in partnership	0.0957	0.0900,0.1014	0.0800	0.0748,0.0852
Divorced, widowed	0.0038	0.0026,0.0050	0.0011	0.0005,0.0017
Children				
Without children	0.9730	0.9699,0.9760	0.9649	0.9615,0.9684
Children	0.0270	0.0240,0.0301	0.0351	0.0316,0.0385
Observations	11'211		11'303	

Data: SGS, own calculations.

Table A2. Descriptive statistics: Fifth year after graduation.

	Women		**Men**	
	Proportion Mean/SD	*95%- CI Min./Max.*	*Proportion Mean/SD*	*95%- CI Min./Max.*
Gross monthly income	6'294/2219	926; 18'952	7378/2802	1001; 30'635
Degree				
BA	0.1604	0.1490,0.1718	0.1378	0.1274,0.1482
MA	0.8396	0.8282,0.8510	0.8622	0.8518,0.8726
Field of study				
Social Sciences, Humanities	0.3500	0.3349,0.3650	0.1260	0.1158,0.1362
Economics	0.1685	0.1557,0.1812	0.2742	0.2600,0.2884
Law	0.1898	0.1771,0.2025	0.1169	0.1069,0.1269
Science	0.1669	0.1553,0.1785	0.2383	0.2255,0.2511
Medicine/Pharmacy	0.0507	0.0436,0.0578	0.0197	0.0153,0.0241
Technical Sciences	0.0742	0.0659,0.0826	0.2249	0.2123,0.2375
Type of university				
Cantonal university	0.8578	0.8469,0.8686	0.6569	0.6425,0.6713
ETH/EPFL	0.1422	0.1314,0.1531	0.3431	0.3287,0.3575
Final grade	5.17/0.38	4.00; 6.00	5.19/0.39	4.00; 6.00
Age	30.65/2.14	26.00; 39.00	31.01/2.22	25.00; 39.00
Cohort				
2006	0.1077	0.0979,0.1176	0.1468	0.1361,0.1574
2008	0.1938	0.1808,0.2068	0.2249	0.2117,0.2381
2010	0.2791	0.2648,0.2934	0.2693	0.2556,0.2829
2012	0.4194	0.4036,0.4351	0.3591	0.3443,0.3738
Completed additional training at university				
No training completed	0.8401	0.8284,0.8518	0.8272	0.8155,0.8388
At same level	0.0915	0.0822,0.1007	0.0686	0.0607,0.0765
Higher qualification	0.0685	0.0605,0.0764	0.1042	0.0949,0.1136
Other training completed				
No	0.7795	0.7664,0.7927	0.8391	0.8278,0.8503
Yes	0.2205	0.2073,0.2336	0.1609	0.1497,0.1722
In training at the time of the survey				
Not in training	0.7605	0.7468,0.7742	0.7636	0.7505,0.7766
In training	0.2395	0.2258,0.2532	0.2364	0.2234,0.2495
Weekly working hours	36.94/8.19	8.00; 80.00	39.61/6.4	8.00; 75.00
Language region of employer				
German-speaking	0.5594	0.5433,0.5755	0.5950	0.5796,0.6104
French-/Italian-speaking	0.3556	0.3400,0.3713	0.3058	0.2913,0.3204
Abroad	0.0849	0.0752,0.0947	0.0992	0.0893,0.1091
Marital status				
Single	0.7209	0.7062,0.7356	0.7481	0.7345,0.7617
Married, in partnership	0.2650	0.2505,0.2795	0.2465	0.2330,0.2600
Divorced, widowed	0.0141	0.0098,0.0183	0.0054	0.0028,0.0079
Children				0.8441,0.8660
Without children	0.8435	0.8317,0.8554	0.8550	0.1340,0.1559
Children	0.1565	0.1446,0.1683	0.1450	0.8441,0.8660
Observations	3'992		4'306	

Data: SGS, own calculations.

Table A3. Men's monthly income (log.) in the first and fifth year after graduation and relative income growth, results of selection equations for Table 1.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.536***	(0.045)	0.321***	(0.089)	0.539***	(0.096)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.425***	(0.047)	−0.417***	(0.101)	−0.468***	(0.106)
Law	−0.364***	(0.053)	−0.508***	(0.105)	−0.579***	(0.111)
Science	−0.466***	(0.050)	−0.472***	(0.094)	−0.597***	(0.100)
Medicine/Pharmacy	0.014	(0.086)	−0.089	(0.196)	−0.149	(0.206)
Technical Sciences	−0.203**	(0.070)	−0.118	(0.134)	−0.218	(0.140)
Type of university (*Ref. cantonal university*)						
ETH/EPFL	0.128*	(0.053)	0.153	(0.093)	0.188	(0.096)
Final grade	0.394***	(0.042)	0.293***	(0.083)	0.360***	(0.087)
Age	0.030***	(0.008)	−0.009	(0.014)	−0.008	(0.015)
Cohort (*Ref.: 2006*)						
2008	−0.103	(0.078)	−0.306**	(0.100)	−0.078	(0.100)
2010	−0.133	(0.075)	−0.234*	(0.099)	0.022	(0.099)
2012	−0.139	(0.072)	−0.278**	(0.096)	−0.035	(0.096)
2014	−0.213**	(0.071)				
2016	−0.214**	(0.071)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.412***	(0.087)	−0.227*	(0.097)	−0.311**	(0.107)
Higher qualification	−0.463	(0.319)	−0.536***	(0.083)	−0.525***	(0.085)
Other training completed (*Ref: no*)						
Yes	−0.165*	(0.076)	0.306**	(0.104)	0.292**	(0.108)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.121***	(0.032)	−0.525***	(0.060)	−0.554***	(0.063)
Marital status (*Reference: married/in a partnership*)						
Single/divorced/widowed	0.027	(0.063)	−0.176*	(0.085)	−0.170	(0.090)
Divorced/widowed	−0.793*	(0.313)				
No children (*Ref.: children*)	−0.070	(0.091)	−0.153	(0.112)	−0.169	(0.115)
Constant	−1.755***	(0.328)	0.804	(0.639)	0.006	(0.671)
athrho	0.001	(0.011)	−0.017	(0.045)	−0.011	(0.010)
lnsigma	−1.048***	(0.009)	−1.267***	(0.014)	0.304	(0.185)
N (selected/censored)	11'303/1'846		4'306/431		3'696/431	
Wald chi^2/ DF	5782.671/22		3001.256/19		578.535/20	

Note: See Table 1.

Table A4. Women's monthly income (log.) in the first and fifth year after graduation and relative income growth, results of selection equations for Table 2.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.275***	(0.041)	0.386***	(0.079)	0.557***	(0.083)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.020	(0.043)	−0.078	(0.095)	−0.088	(0.099)
Law	0.130*	(0.054)	−0.185	(0.109)	−0.249*	(0.113)
Science	−0.219***	(0.054)	−0.335**	(0.109)	−0.407***	(0.114)
Medicine/Pharmacy	0.112	(0.062)	0.187	(0.164)	0.168	(0.168)
Technical Sciences	−0.217*	(0.086)	−0.309	(0.174)	−0.385*	(0.177)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.139*	(0.064)	0.254*	(0.117)	0.297*	(0.119)
Final grade	0.185***	(0.038)	0.045	(0.081)	0.099	(0.086)
Age	0.014*	(0.007)	−0.040**	(0.013)	−0.037**	(0.013)
Cohort (*Ref.: 2006*)						
2008	0.161	(0.082)	−0.092	(0.110)	0.170	(0.116)
2010	0.186*	(0.078)	−0.185	(0.102)	0.090	(0.106)
2012	0.119	(0.074)	−0.150	(0.099)	0.111	(0.103)
2014	0.010	(0.073)				
2016	0.077	(0.073)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.093	(0.083)	−0.237*	(0.092)	−0.325**	(0.099)
Higher qualification	−0.226	(0.278)	−0.615***	(0.096)	−0.614***	(0.098)
Other training completed (*Ref.: no*)						
Yes	−0.106	(0.062)	0.241**	(0.082)	0.252**	(0.085)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.028	(0.030)	−0.358***	(0.061)	−0.390***	(0.063)
Marital status (*Ref.: married/in a partnership*)						
Single/divorced/widowed	0.151***	(0.040)	0.083	(0.071)	0.102	(0.071)
Divorced/widowed	0.393	(0.226)				
No children (*Ref.: children*)	0.520***	(0.060)	0.427***	(0.084)	0.415***	(0.080)
Constant	−1.219***	(0.290)	1.927***	(0.567)	1.120	(0.603)
athrho	−1.183***	(0.050)	−0.176*	(0.089)	−0.012	(0.032)
lnsigma	−0.828***	(0.010)	−1.297***	(0.015)	−0.151	(0.135)
N (selected/censored)	11'211/1'891		3'992 /473		3'449/473	
Wald chi^2/ DF	3265.465/22		2440.174/19		1413.777/20	

Note: See Table 2.

Table A5. Men's monthly income (log.) in the first and fifth year after graduation and their relative income growth; models with interaction terms—shown in Figure 1.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.006	(0.048)	0.079**	(0.025)	−1.172	(1.199)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.280***	(0.013)	−0.222***	(0.017)	−0.316*	(0.124)
Law	−0.478***	(0.016)	−0.149***	(0.017)	−0.155	(0.149)
Science	−0.326***	(0.012)	−0.287***	(0.017)	−0.623***	(0.130)
Medicine/Pharmacy	−0.140***	(0.013)	−0.176***	(0.023)	−0.232**	(0.083)
Technical Sciences	−0.260***	(0.016)	−0.281***	(0.022)	−0.551***	(0.111)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.125***	(0.013)	0.087***	(0.018)	0.187*	(0.074)
Final grade	0.039***	(0.010)	0.059***	(0.014)	0.082	(0.072)
Age	0.022***	(0.002)	0.014***	(0.002)	0.030***	(0.009)
Cohort (*Ref.: 2006*)						
2008	0.025	(0.055)	0.015	(0.040)	−1.061	(1.273)
2010	−0.117*	(0.059)	−0.039	(0.039)	−1.509	(1.241)
2012	−0.213***	(0.055)	−0.109***	(0.033)	−1.582	(1.278)
2014	−0.177***	(0.054)				
2016	−0.116*	(0.056)				
Degree · Cohort (*Ref.: BA · 2006*)						
MA · 2008	−0.021	(0.057)	0.014	(0.043)	1.090	(1.275)
MA · 2010	0.136*	(0.061)	0.049	(0.042)	1.469	(1.252)
MA · 2012	0.219***	(0.057)	0.105**	(0.036)	1.513	(1.282)
MA · 2014	0.196***	(0.056)				
MA · 2016	0.123*	(0.058)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.026	(0.029)	−0.011	(0.021)	−0.129	(0.200)
Higher qualification	−0.077*	(0.031)	−0.072***	(0.016)	−0.230	(0.121)
Other training completed (*Ref.: no*)						
Yes	0.067***	(0.018)	0.076***	(0.012)	0.161	(0.093)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.234***	(0.008)	−0.257***	(0.012)	−0.643***	(0.089)
Weekly working hours	0.015***	(0.001)	0.024***	(0.001)	0.043***	(0.005)
Language region of employer (*Ref.: German-speaking*)						
French-/Italian-speaking	−0.090***	(0.008)	−0.133***	(0.010)	−0.176***	(0.046)
Italian-speaking	−0.266***	(0.021)				
Abroad	−0.353***	(0.016)	−0.298***	(0.023)	−0.506***	(0.074)
Log. monthly income 0' year					−2.591***	(0.365)
Constant	7.461***	(0.091)	7.337***	(0.112)	22.398***	(3.999)
Selection equation						
Degree: MA (*Ref.: BA*)	0.267	(0.169)	0.214	(0.159)	1.164***	(0.194)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.423***	(0.047)	−0.418***	(0.101)	−0.487***	(0.108)
Law	−0.361***	(0.053)	−0.515***	(0.105)	−0.571***	(0.112)
Science	−0.465***	(0.050)	−0.478***	(0.094)	−0.606***	(0.101)
Medicine/Pharmacy	0.018	(0.086)	−0.091	(0.196)	−0.154	(0.204)
Technical Sciences	−0.199**	(0.070)	−0.127	(0.134)	−0.237	(0.140)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.129*	(0.053)	0.157	(0.093)	0.186	(0.096)
Final grade	0.394***	(0.042)	0.295***	(0.083)	0.361***	(0.088)
Age	0.030***	(0.008)	−0.009	(0.014)	−0.007	(0.015)

Table A5. (Cont.) Men's monthly income (log.) in the first and fifth year after graduation and their relative income growth; models with interaction terms—shown in Figure 1.

	1st year		5th year		relative income growth	
Cohort (*Ref.: 2006*)						
2008	−0.316	(0.188)	−0.355	(0.192)	0.382	(0.231)
2010	−0.375*	(0.176)	−0.421*	(0.182)	0.562*	(0.218)
2012	−0.436**	(0.169)	−0.314	(0.170)	0.589**	(0.207)
2014	−0.461**	(0.169)				
2016	−0.378*	(0.171)				
Degree · Cohort (*Ref.: BA · 2006*)						
MA · 2008	0.257	(0.206)	0.096	(0.225)	−0.629*	(0.260)
MA · 2010	0.292	(0.194)	0.259	(0.214)	−0.720**	(0.247)
MA · 2012	0.359	(0.186)	0.078	(0.202)	−0.820***	(0.235)
MA · 2014	0.298	(0.186)				
MA · 2016	0.201	(0.187)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.405***	(0.087)	−0.211*	(0.099)	−0.359***	(0.108)
Higher qualification	−0.466	(0.319)	−0.534***	(0.083)	−0.536***	(0.085)
Other training completed (*Ref.: no*)						
Yes	−0.165*	(0.076)	0.308**	(0.104)	0.285**	(0.108)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.122***	(0.032)	−0.526***	(0.060)	−0.559***	(0.063)
Marital status (*Ref.: married/in a partnership*)						
Single/divorced/widowed	0.027	(0.063)	−0.173*	(0.086)	−0.178*	(0.091)
Divorced/widowed	−0.789*	(0.313)				
No children (*Ref.: children*)	−0.073	(0.091)	−0.152	(0.112)	−0.160	(0.115)
Constant	−1.532***	(0.356)	0.845	(0.645)	−0.448	(0.684)
athrho	0.005	(0.011)	−0.004	(0.047)	−0.004	(0.011)
lnsigma	−1.050***	(0.009)	−1.268***	(0.014)	0.298	(0.182)
N (selected/censored)	11'303/1'846		4'306/431		3'696/431	
Wald chi^2/ DF	5841.234/27		3013.691/22		591.737	

Data: SGS, own calculations. Notes: log. gross monthly income (deflated to base May 2000); estimations based on Full-Maximum-Likelihood method using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A6. Women's monthly income (log.) in the first and fifth year after graduation and their relative income growth; models with interaction terms—shown in Figure 2.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	−0.079	(0.055)	0.092***	(0.026)	−0.510	(0.473)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.226***	(0.012)	−0.171***	(0.016)	−0.302***	(0.049)
Law	−0.422***	(0.015)	−0.082***	(0.017)	−0.057	(0.062)
Science	−0.254***	(0.015)	−0.216***	(0.019)	−0.425***	(0.062)
Medicine/Pharmacy	−0.112***	(0.014)	−0.151***	(0.019)	−0.188***	(0.056)
Technical Sciences	−0.215***	(0.022)	−0.213***	(0.027)	−0.348***	(0.073)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.080***	(0.017)	0.036	(0.019)	0.050	(0.046)
Final grade	0.011	(0.012)	0.019	(0.013)	−0.049	(0.055)
Age	0.017***	(0.002)	0.003	(0.002)	0.002	(0.008)
Cohort (*Ref.: 2006*)						
2008	−0.016	(0.061)	−0.087*	(0.037)	−0.894	(0.474)
2010	−0.032	(0.060)	−0.011	(0.034)	−0.748	(0.476)
2012	−0.064	(0.055)	−0.031	(0.029)	−0.834	(0.476)
2014	−0.075	(0.057)				
2016	−0.043	(0.056)				
Degree · Cohort (*Ref.: BA · 2006*)						
MA · 2008	0.080	(0.067)	0.109**	(0.042)	0.872	(0.482)
MA · 2010	0.094	(0.065)	0.024	(0.038)	0.689	(0.481)
MA · 2012	0.130*	(0.061)	0.038	(0.033)	0.784	(0.481)
MA · 2014	0.172**	(0.062)				
MA · 2016	0.119	(0.061)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	0.052	(0.027)	0.002	(0.018)	0.060	(0.081)
Higher qualification	−0.034	(0.054)	−0.039*	(0.019)	−0.255***	(0.049)
Other training completed (*Ref.: no*)						
Yes	0.041	(0.021)	0.066***	(0.011)	0.203***	(0.043)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.199***	(0.009)	−0.127***	(0.012)	−0.312***	(0.039)
Weekly working hours	0.014***	(0.001)	0.024***	(0.001)	0.033***	(0.002)
Language region of employer (*Ref.: German-speaking*)						
French-/Italian-speaking	−0.053***	(0.008)	−0.095***	(0.010)	−0.176***	(0.041)
Italian-speaking	−0.220***	(0.022)				
Abroad	−0.322***	(0.019)	−0.439***	(0.024)	−0.683***	(0.075)
Log. monthly income 1st year					−2.083***	(0.124)
Constant	7.756***	(0.098)	7.763***	(0.107)	19.025***	(1.439)
Selection equation						
Degree: MA (*Ref.: BA*)	0.377*	(0.173)	0.538**	(0.173)	1.633***	(0.228)
Field of study (*Reference: Economics*)						
Social Sciences, Humanities	−0.024	(0.043)	−0.087	(0.095)	−0.127	(0.101)
Law	0.125*	(0.055)	−0.179	(0.109)	−0.239*	(0.115)
Science	−0.221***	(0.054)	−0.337**	(0.109)	−0.435***	(0.116)
Medicine/Pharmacy	0.108	(0.062)	0.194	(0.165)	0.151	(0.169)
Technical Sciences	−0.219*	(0.086)	−0.310	(0.174)	−0.408*	(0.179)
Type of university (*Reference: cantonal university*)						
ETH/EPFL	0.139*	(0.064)	0.251*	(0.118)	0.293*	(0.120)
Age	0.014*	(0.007)	−0.040**	(0.013)	−0.034*	(0.014)

Table A6. (Cont.) Women's monthly income (log.) in the first and fifth year after graduation and their relative income growth; models with interaction terms—shown in Figure 2.

	1st year		5th year		relative income growth	
Cohort (*Ref.: 2006*)						
2008	0.326	(0.185)	0.179	(0.200)	1.154***	(0.253)
2010	0.286	(0.179)	−0.215	(0.166)	0.868***	(0.221)
2012	0.228	(0.168)	−0.001	(0.160)	1.072***	(0.217)
2014	0.056	(0.169)				
2016	0.184	(0.169)				
Degree · Cohort (*Ref.: BA · 2006*)						
MA · 2008	−0.195	(0.206)	−0.382	(0.244)	−1.331***	(0.292)
MA · 2010	−0.113	(0.198)	−0.017	(0.209)	−1.085***	(0.258)
MA · 2012	−0.120	(0.187)	−0.235	(0.202)	−1.302***	(0.252)
MA · 2014	−0.040	(0.187)				
MA · 2016	−0.118	(0.187)				
Completed additional training at university (*Reference: no add. training completed*)						
At same level	−0.089	(0.083)	−0.242**	(0.093)	−0.352***	(0.099)
Higher qualification	−0.218	(0.285)	−0.614***	(0.096)	−0.614***	(0.098)
Other training completed (*Ref.: no*)						
Yes	−0.105	(0.062)	0.239**	(0.082)	0.244**	(0.085)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.028	(0.030)	−0.351***	(0.061)	−0.382***	(0.063)
Marital status (*Ref.: married/in a partnership*)						
Single/divorced/widowed	0.151***	(0.040)	0.085	(0.071)	0.098	(0.071)
Divorced/widowed	0.389	(0.227)				
No children (*Ref.: children*)	0.523***	(0.061)	0.424***	(0.084)	0.411***	(0.081)
Constant	−1.317***	(0.323)	1.840**	(0.568)	0.218	(0.624)
athrho	−1.173***	(0.051)	−0.163	(0.088)	−0.003	(0.070)
lnsigma	−0.830***	(0.011)	−1.298***	(0.015)	−0.154	(0.135)
N (selected/censored)	11'211/1'891		3'992/473		3'449/473	
Wald chi^2/ DF	3279.190/27		2486.239/22		1491.904/23	

Data: SGS, own calculations. Notes: Log. gross monthly income (deflated to base May 2000); estimations based on Full-Maximum-Likelihood method using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A7. Men's monthly income (log.) in the first and fifth year after graduation and relative income growth; OLS-models.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.143***	(0.016)	0.124***	(0.017)	0.055	(0.133)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.280***	(0.013)	−0.223***	(0.018)	−0.341**	(0.115)
Law	−0.479***	(0.016)	−0.148***	(0.017)	−0.169	(0.162)
Science	−0.327***	(0.012)	−0.285***	(0.017)	−0.638***	(0.135)
Medicine/Pharmacy	−0.139***	(0.013)	−0.175***	(0.023)	−0.247**	(0.081)
Technical Sciences	−0.262***	(0.016)	−0.281***	(0.022)	−0.577***	(0.119)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.124***	(0.013)	0.086***	(0.018)	0.181*	(0.073)
Final grade	0.039***	(0.010)	0.058***	(0.014)	0.086	(0.072)
Age	0.022***	(0.002)	0.014***	(0.002)	0.027**	(0.010)
Cohort (*Ref.: 2006*)						
2008	−0.001	(0.017)	0.016	(0.015)	−0.094	(0.158)
2010	0.002	(0.016)	−0.005	(0.015)	−0.194	(0.139)
2012	−0.018	(0.016)	−0.026	(0.014)	−0.227	(0.149)
2014	−0.003	(0.015)				
2016	−0.010	(0.015)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	−0.031	(0.029)	−0.019	(0.021)	−0.169	(0.231)
Higher qualification	−0.077*	(0.031)	−0.073***	(0.016)	−0.237	(0.127)
Other training completed (*Ref.: no*)						
Yes	0.066***	(0.018)	0.075***	(0.012)	0.155	(0.097)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.233***	(0.008)	−0.257***	(0.012)	−0.650***	(0.093)
Weekly working hours	0.015***	(0.001)	0.024***	(0.001)	0.043***	(0.005)
Language region of employer (*Ref.: German-speaking*)						
French-/Italian-speaking	−0.089***	(0.008)	−0.133***	(0.010)	−0.172***	(0.046)
Italian-speaking	−0.261***	(0.021)				
Abroad	−0.352***	(0.016)	−0.298***	(0.023)	−0.507***	(0.075)
Log. monthly income 1st year					−2.587***	(0.374)
Constant	7.339***	(0.080)	7.319***	(0.112)	21.356***	(3.324)
Observations	11'303		4'306		3'696	
R^2	0.386		0.493		0.459	
F(df1, df2)	(22, 11280) = 262.94		(19, 4306) = 162.64		(20, 3675) = 28.75	

Data: SGS, own calculations. Notes: Log. gross monthly income (deflated to base May 2000); estimations based on OLS regression using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A8. Women's monthly income (log.) in the 1st and 5th year after graduation and relative income growth; OLS-models.

	1st year		5th year		relative income growth	
Degree: MA (*Ref.: BA*)	0.100***	(0.014)	0.136***	(0.014)	0.211**	(0.070)
Field of study (*Ref.: Economics*)						
Social Sciences, Humanities	−0.252***	(0.011)	−0.174***	(0.016)	−0.320***	(0.052)
Law	−0.457***	(0.014)	−0.082***	(0.017)	−0.068	(0.065)
Science	−0.309***	(0.014)	−0.219***	(0.019)	−0.441***	(0.063)
Medicine/Pharmacy	−0.110***	(0.012)	−0.149***	(0.019)	−0.200***	(0.058)
Technical Sciences	−0.254***	(0.019)	−0.215***	(0.027)	−0.364***	(0.074)
Type of university (*Ref.: cantonal university*)						
ETH/EPFL	0.108***	(0.015)	0.038*	(0.018)	0.050	(0.045)
Final grade	0.046***	(0.010)	0.020	(0.013)	−0.044	(0.056)
Age	0.018***	(0.002)	0.002	(0.002)	0.004	(0.009)
Cohort (*Ref.: 2006*)						
2008	0.076***	(0.023)	−0.004	(0.017)	−0.108	(0.088)
2010	0.071**	(0.022)	−0.002	(0.016)	−0.123	(0.076)
2012	0.068**	(0.021)	−0.008	(0.015)	−0.125	(0.075)
2014	0.083***	(0.021)				
2016	0.072***	(0.020)				
Completed additional training at university (*Ref.: no add. training completed*)						
At same level	0.024	(0.024)	−0.002	(0.018)	0.054	(0.081)
Higher qualification	−0.026	(0.034)	−0.047**	(0.018)	−0.254***	(0.047)
Other training completed (*Ref.: no*)						
Yes	0.019	(0.019)	0.069***	(0.011)	0.205***	(0.044)
In training at the time of the survey (*Ref.: not in training*)						
In training	−0.208***	(0.009)	−0.130***	(0.012)	−0.311***	(0.038)
Weekly working hours	0.015***	(0.001)	0.024***	(0.001)	0.033***	(0.002)
Language region of employer (*Ref.: German-speaking*)						
French-/Italian-speaking	−0.056***	(0.008)	−0.096***	(0.010)	−0.173***	(0.042)
Italian-speaking	−0.245***	(0.022)				
Abroad	−0.375***	(0.018)	−0.440***	(0.025)	−0.680***	(0.074)
Log. monthly income 1st year					−2.083***	(0.125)
Constant	7.281***	(0.078)	7.748***	(0.107)	18.290***	(1.298)
Observations	11'211		3'992		3'449	
R^2	0.326		0.502		0.629	
F(df1, df2)	(22, 11188) = 238.16		(19, 3972) = 146.53		(20, 3428) = 70.26	

Data: SGS, own calculations. Notes: Log. gross monthly income (deflated to base May 2000); estimations based on OLS regression using survey weights. Standard errors in parentheses, significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Reference

FSO. (2017). *Abschlüsse der universitären Hochschulen nach Jahr, Examensstufe, Fachrichtung, Geschlecht und Hochschule* [University degrees by year, examination level, field of study, gender and university]. Neuchâtel: Federal Statistical Office.